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# Twins Brought up Apart

THE PRESENT PAPER, based on a talk given at a symposium on Genetics in Psychiatry, held at the Maudsley Hospital in October 1956, takes the form of an informal discussion of the provisional findings in an investigation at present in progress into uniovular (i.e. genetically identical) twins brought up in different homes. At that time the series consisted of thirty-eight pairs.\*

### The literature

Up till now the largest single series of such twins to have been investigated is exactly half the size of the present material. The results of the classical investigation of Newman, Freeman and Holzinger<sup>11</sup> are well known. Briefly, they found that their nineteen pairs of separated identical twins (mostly adults) resembled one another in intelligence rather more closely than fraternal twins, but not quite so closely as identical twins brought up together and still attending school. Their findings as regards personality were inconclusive, though the case histories when they touch on this subject are of interest still. When expressing themselves separately on the significance of their findings, it is interesting that the three authors differ somewhat in their emphasis. According to Woodworth,<sup>17</sup> the psychologist (Freeman) considers the study showed that "human nature may be improved or debased to a degree that many have thought impossible". The statistician (Holzinger) points out that "relatively great environmental differences must be present to produce a noticeable effect"; while the biologist (Newman) confesses to have been "much more impressed with the very great intra-pair similarities after the twins

had been exposed to all sorts of environmental differences", than he was with the differences between them.

Barbara Burks,<sup>2, 3</sup> whose work on foster children is well known, has investigated five pairs of twins brought up apart: one of them is probably binovular. Only one case has been reported fully, the others having been left incomplete when she died. In the first pair she brings out clearly the nature both of the similarities and of the differences, and in most of them she is able to show plausible relationships between minor personality traits and differences in the twins' experiences. One of Burks's twins was for a while in a State Mental Hospital, her twin partner not requiring psychiatric treatment. Unfortunately, the nature of her complaint is unclear.

Cases of schizophrenia occurring in both members of a pair of uniovular twins brought up apart have been reported, together with the evidence on which the diagnosis is based, by Kallmann<sup>8</sup> and by Craike and Slater.<sup>4\*</sup> An instance of concordance for manic-depressive psychosis in uniovular twins brought up apart is given by Stenstedt.<sup>16</sup> There have been other single case reports, mostly on psychological lines, of twins brought up apart, for example, those of Muller,<sup>10</sup> Saudek,<sup>12</sup> Gardner and Newman,<sup>5</sup> Schwesinger<sup>13</sup> and Yoshimasu.<sup>18</sup> One of Lange's<sup>9</sup> concordant criminal twin pairs was separated, but not till the age of eight. Gladys Schwesinger's Mexican pair is interesting, not only for its story but for the different interpretations that can be put on it. Very briefly, these girls, last observed when one of them died at eighteen, had for some four years shown pretty severe behaviour problems of a similar kind. They were institutionalized, first

\* In December 1957 forty-one uniovular twins brought up apart have been investigated, and there is some further relevant information on another five uniovular and ten binovular pairs. The separated uniovular pairs are now being compared with a matched control series of uniovular twins brought up together.

\* Since this talk was given, another such case has come to light at the Maudsley Hospital and has been investigated in this Unit.

separately, then together. One was a little more tense than the other. This one got in with a group of adolescents who took drugs, and she was found dead one day from morphine injections. The surviving twin, who had remained out of trouble for a few months after this, had the kinder mother. The author's conclusion, apparently underestimating the four years of instability of this twin, is to stress the importance for temperamental stability of "love, permissiveness, relaxation and emotional security in mother-child relationships", as exemplified by the mother of this twin.

An opposite danger in interpretation is seen in Yoshimasu's case. Here one of the twins, brought up by neglectful foster-parents, becomes a persistent criminal; the other, brought up by a good mother and later by a religious step-mother, leads a blameless life as a parson. The author draws the obvious moral; but when it comes to psychiatric classification both twins, are put down as weak-willed psychopaths!

We shall look forward with interest to the contribution which Scandinavian workers are making to the study of twins brought up apart. Dr. Juel-Nielsen<sup>6,7</sup> of Copenhagen is making an intensive investigation of about a dozen pairs, and a small series is also under investigation by Professor Husén's department in Stockholm.<sup>6</sup>

#### **The present twins and how they were separated**

Our present material consists of twins brought up apart who sent their names in to the B.B.C. following a television programme in 1953, in which a special appeal was made for such twins to come forward. Up to the present thirty-eight uniovular pairs, including two from other sources, have been investigated, most of them completely.

I ought perhaps to say briefly how I have investigated the twins. The great majority I have interviewed personally, but we have asked colleagues to investigate twins in Scotland, Germany and Chile. Ovularity diagnosis includes full blood grouping, finger prints and P.T.C. testing. I was prepared when need be to see the twins in their homes, but the majority came—mostly together—to the Maudsley Hospital. Before being seen, the twins were asked to complete a booklet giving some information

about themselves and including a personality test kindly devised for us by Professor H. J. Eysenck who also advised on intelligence testing. In cases where the twins came together one twin could be interviewed on his own while the other did an intelligence test. The main object was of course to obtain a history and an assessment of the personality of each twin, supplementing information obtained from the twins on interview with that from outside sources where necessary. Several pairs spent the best part of a day here.

Women appear to volunteer for this kind of research more readily than men; we have twenty-five female and only thirteen male pairs, a number of the men indeed having been induced to participate by their wives or parents. (We cannot afford to be too particular about obtaining a completely random sample of twins brought up apart.) We have only four pairs under the age of twenty. The remainder are in their thirties, forties or fifties and are on the whole older than Newman's twins. They come from all parts of the country.

Twenty-five were separated during the first year of life, most of them soon after birth—indeed one was taken from his mother before his twin brother had been born; six were separated during the second year, and four between the ages of two and four years. The proportion of early separations is as high as in Newman's series. I thought it worth while also to include three pairs that were not separated till seven, eight or nine years of age to see how significant age at separation might be. For similar reasons I included two pairs that had been parted for the supposedly all-important first five years and then reunited. There were a few others who were reunited shortly before leaving school. Our series includes two pairs that have never met, and one where we were able to bring the twins together for the first time at the age of thirty-six; one of these women had had no idea she was a twin until she heard from us; the other had no idea whether her twin was a brother or a sister and whether alive or dead. This pair was remarkably alike in personality and I am glad to say they were overjoyed at meeting. Five other pairs did not meet till their late teens or mid-twenties. The others had varying degrees

of contact during childhood. They all, however, came from different homes.

The reasons for these twins being parted were various. Illegitimacy accounts for six pairs, the death of the mother for eight. The most frequent reason was that the mother was ill, pregnant again or considered unable to look after both twins, one of whom might have been particularly delicate. There were eighteen such cases; often a grandmother who was maternal in both senses of the word, or a childless aunt, was an important factor here in addition to the mother's indisposition, or—as happened in a further three cases—to father's unemployment. In two cases the children were removed from home by the Poor Law authorities. In one case the father sold one twin to settle his debts. This twin has lived in Chile all her life where she has married a Frenchman; her sister came to Denmark during childhood, and has now married an Englishman. Geographical separation ranges from this pair down to a pair of boys who live next door to one another, brought up by aunts who are sisters.

In twelve cases the twins were brought up in families that were unrelated to one other. In the remainder they were brought up by different branches of the same family, in twenty cases one twin staying with his own mother. Their families differed widely in family structure and in personality of the foster parents.

There are advantages in having a varied material like this because of the possibility it offers for making internal comparisons. The less extreme separations are as interesting in their way as the others, since here a greater number of environmental variables are controlled. Cases involving a wide degree of social and cultural separation are, of course, extremely valuable. If in spite of many differences of this kind the twins are nevertheless alike in some respects we may have enough evidence to convince even the biggest sceptic of the importance of heredity; but they would undoubtedly show major differences in other respects, and how could we tell which factors in the environment had caused them?

The separation of these particular twins worked out fairly well in most cases. The children accepted their respective homes as their

own, though a twin who was brought up as an only child was apt to feel lonely when he knew he had brothers and sisters; their respective families (when known to one another) generally accepted the situation too. This was particularly so when one twin was brought up by the mother, the other by a maternal grandmother or maternal aunt. There were, however, seven or eight cases where there was disagreement over the custody or upbringing of the child, for instance, between a paternal relative and the mother or between a stepmother and a maternal aunt. The influence of these differences of view was generally reflected in some aspect of the twins' behaviour. Judging by later mental health, the separation of one twin from the mother does not appear to have been a traumatic experience for that twin, either by reason of deprivation of breast-feeding or by the change of mother-figure in later infancy or very early childhood. Reunion with the family when it occurred during childhood sometimes gave rise to difficulties in adjustment, mostly temporary ones. Attachment between the twins in adult life varied considerably in closeness.

### Intelligence

Two short tests of intelligence were administered to the twins, the Dominoes, which is a non-verbal test somewhat similar to the Matrices, and the Synonyms section of the Mill Hill Vocabulary Scale. On the Dominoes the intra-class correlation coefficient between the twins was 0.77; on the Mill Hill Vocabulary it was 0.74. This is very slightly higher than the correlation of 0.64 found by Newman for Binet I.Q. The difference, if reliable, is possibly due to the fact that some of Newman's pairs had widely different educations. Thus, even when brought up apart, identical twins tend to resemble one another in intelligence more closely than ordinary siblings brought up together ( $r=0.5$ ). Identical twins reared together have been reported in some investigations to have a correlation for intelligence as high as 0.9. However, Blewett<sup>1</sup> who tested a series of twin school-children, which we also investigated in the Genetics Unit here,<sup>14</sup> found a correlation between identical twins of only 0.76 on the factor score derived from a battery of intelligence tests.

In five of the present pairs one twin had a moderate educational advantage and did a good deal better on both intelligence tests. The size of family in which the twins were brought up did not seem to have any direct bearing on intelligence. There was a tendency for the more intelligent twin to be the one who volunteered for the research.

### Personality

Our main interest was in personality resemblances and differences. How much alike were these twins, brought up as they were by different mothers and with no, or relatively little, contact with their twin partners? And how are differences between the twins related to their respective environments?

In order to answer these questions we have to make some attempt to assess the overall resemblance of each pair. Judging from their histories and from the impression they made on interview, there were some pairs who showed a very close similarity in important respects—for example, in one pair both twins were of superior intelligence, were active as teachers and writers and possessed a considerable degree of organizing ability; in another, both members of the pair had been advised to enter mental hospital for symptoms of anxiety and depression; another pair was strikingly alike in the twins' liability to tempers, another in their lack of energy, and so on. I have classified the material into four groups. In the group showing the closest resemblance I have included pairs where there were striking resemblances such as these and differences only of a very minor kind. Into this group there fall six of the thirty-eight pairs. I do not recall ever having come across any pair of binovular twins brought up together who were as alike as any of these six pairs.

My next group consists of pairs with striking resemblances as above but with fairly important differences too, the differences not (on my assessment) as marked as the similarities. Binovular pairs as alike as this are not very common. Among our separated uniovular twins I classified fifteen as belonging to this group.

In the third group are pairs where the similarities and differences are about evenly balanced

in importance and often relate to very ordinary qualities. There were ten such pairs.

Lastly, there are seven pairs where differences are very marked and similarities relatively minor. Some of these I shall mention later.

In addition to history and personal observation, we have the objective results of the self-rating questionnaire. This gives two scores, derived from factor analysis, the one showing the degree of extraversion-introversion and the other the degree of neuroticism. The inter-twin correlation for extraversion of 0.60, that for neuroticism 0.52. Thus, the clinical findings and the psychometric tests give one another some support in their claims that twins brought up apart show significant personality resemblances.

How do these results compare with our findings concerning uniovular twins brought up together? It is difficult to answer this definitely, for no comparable study has yet been made of normal adult twins. It is possible we shall eventually be able to investigate a matched control group of such twins who responded to the same B.B.C. programme from which we obtained most of our present material. However, to judge by experience gained with twins where one has had a neurotic illness and with normal twin school-children,<sup>14</sup> I do not think there is a very great deal of difference. Thus, in his paper read to the British Association, Dr. Slater<sup>15</sup> found seven out of thirty-two uniovular pairs showing very marked differences in degree of neurosis.

### Nature of resemblance

An important point, and one on which the study of twins should be able to throw some light, is whether some aspects of personality are more determined genetically than others. Our material can no doubt be analysed more carefully from this point of view than I have so far been able to do but my impression is that the question is a difficult one to answer definitely. It is understandable that, since persons differ widely in their genes, they should also differ in the particular aspects of personality that for them seem to be genetically determined. If one asks the twins themselves in what way they are most alike they will often say something like this: "In our mannerisms, our voices, the way we

think, in our tastes and interests". From personal observation I would agree that similarities in gesture and mannerisms are often striking, even in twins who have had little or no contact. One pair of male twins aged forty-nine who did not meet till they were ten or eleven, and saw each other only about once a fortnight during adolescence, have met only very rarely since the age of twenty-four when Jim left Durham to come to London during the depression. They have the same way of tapping the table to emphasise a point, of flicking their fingers when stuck for a word and of nodding their heads energetically in approval. Sometimes similarity in speech related not only to tone of voice but to the kind of thing the twins thought it important to say and the way they said it. Twins are also generally much alike in their degree of shyness and sociability. The following case illustrates some of these points. These women of thirty-five were parted at birth and have not met since the age of three. I interviewed both in their homes. Both were awkward in manner at first, remaining standing for quite a few minutes. Both were talkative on the subject of their shyness. They both mentioned spontaneously their interest in sport as children and the fact that they still like watching football matches. They are fond of reading and music. When asked what music they liked the one said she was very fond of Tchaikovsky's first piano concerto but liked the *Messiah* best of all. Her twin sister said she liked Rachmaninov's second piano concerto. A copy of the *Messiah* was on the top of her pile of music.

Similarity in interests and in sociability also show themselves in three pairs where a twin who was active in an organization such as the Townswomen's Guild or the Women's Rural Institute had volunteered for the research. It was found that her twin partner had practically the same social interests and abilities. Conversely there are two or three pairs where both twins described their bashfulness or their dislike of company or their lack of confidence in very similar terms. There are two pairs where both are liable to outbursts of temper and two where an extreme placidity of temperament is outstanding.

These similarities often lead twins into rather

similar social careers. One pair of men gravitated independently to jobs as checkers of stock in a motor factory—they thought this work suited them best. It was not an unusual occupation for the twin to take up who lived in the industrial Midlands, but more surprising in his twin brother who was brought up in the country by the village hairdresser. In another pair each showed a decline in social status, though they differed initially quite a lot in this respect. Before the war the one twin was a head porter of a big hotel. His twin brother owned a jewellery shop employing four assistants. The one is now night porter earning less than he used to collect in tips, the other has sold his shop and repairs watches with no assistance other than his wife's. The decline was partly due to the similarity of their natures, which were perhaps somewhat rigid and schizoid.

Sometimes one is tempted to see a basic similarity manifesting itself in different ways. In one pair each twin reports a change in personality: "All of a sudden" (writes one twin from Canada) "I began to get confidence in myself. I became a leader in church work and worked hard and enjoyed myself. . . ." She also dyed her hair and gave her age as eight years younger. Her twin sister from Lancashire writes: "It has been somewhat difficult to give a true analysis of my character due to the fact that I have considerably slowed down in every way during the last two years. . . ." She has also been troubled greatly by sleeplessness. It may well be that these twins share a cyclothymic constitution.

In another pair, both twins are troubled by considerable anxiety and restlessness. The one is excessively houseproud, does not like to go out more than she can help, and smokes thirty or more cigarettes a day. Her twin sister is slap-dash in manner. Anxiety drives her from the house, generally to the pub where she says she spends all the money she can get. Early training and the contrasted personalities of their husbands may have had something to do with the opposite direction their anxiety took.

#### Personality differences and the environment

This leads us on to differences. The extent of the environmental differences between the twins' homes varied rather widely from pair to pair.

So I thought it worth while to see how degree and kind of separation might be related to the extent of personality resemblance. I rated environmental differences on a points system, adding up all scorable data for each pair, including age at separation, amount of contact, and sociological and psychological differences between the homes. The total scores ranged from five to nineteen points' difference. These overall scores seemed to be related to the extent of personality resemblance in only a random way: all four personality groups averaged between 10 and 11½ points of difference on the environmental scale. Taking age at separation and degree of contact only, there certainly appeared to be no relation between separation and personality resemblance. The most similar group contained pairs who did not meet till seventeen, twenty-four and thirty-six. The pairs brought up together for the first five years showed quite as marked differences as those who were parted at birth. However, taking sociological and psychological differences only, there is at least a suggestion that the more unlike the environment, the more unlike the personality. The strikingly similar pairs averaged 4.3 points of difference, the most unlike pairs 6 points. In other words, kind of separation mattered more than degree of separation. Further analysis of the case histories seems to bear this out.

#### **Poorness of home and neurotic traits**

In twenty-two pairs it was possible to say that one home was poorer than the other psychologically. In twelve of these pairs one twin could be regarded as having been more neurotic as a child; in nine of these it was the child from the poorer home who was more neurotic. In some of them the neurotic tendencies may have been only slight and temporary, but in others, though minor, they persisted into adult life. Thus, Janet was brought up by an obsessional father and a mother who was a demanding invalid. She bit her nails as a child while her twin did not, and as an adult she is more anxious and obsessional.

But in others the neurotic tendencies are very marked. Alf was neglected till he was two and then brought up by a cruel and nagging step-mother. As a boy he had many fears, used to sulk, tried to run away and eventually did so.

Soon after, he was discharged from the Army on what were probably psychiatric grounds; and at the age of thirty-seven he was treated in a neurosis centre for hysteria. He is chronically more anxious and sensitive than his twin who was not subjected to these unfortunate experiences.

Another case is that of a girl whose mother was unreliable and inconsistent and probably preferred Doris's younger brother. Doris sucked a dummy till she was five, was unhappy at school and walked in her sleep till fifteen. At twenty-seven she attended a psychiatrist who diagnosed a neurotic depression. Her uniovular twin has manifested no obvious neurotic tendencies.

The three cases where the twin from the poorer home was actually less "neurotic" than the other in a way go to prove the point. Two of them were cases where the twins were not separated till seven and eight, and by that time one was already more anxious or hysterical than the other. The other case is of a lad whose slowness, awkwardness, obstinacy and inability to hold a job were attributable to his epileptic fits.

There were a further three cases where childhood experiences seemed to be related to psychiatric troubles in later life, though there was no clear evidence that one twin was the more neurotic child. One of these is the Danish twin mentioned earlier. She had a psychopathic father and her early life was very unsettled. She was thrown on her own resources in Denmark while her twin lived a protected existence in Chile. Though happily settled in England now, the Danish twin led a troubled life when younger, and was at one time treated in hospital where a diagnosis of neurosis was made. Both twins have cyclothymic and hysterical traits, but these have not led the Chilean twin into so much difficulty.

These cases appear to lend some support to views relating certain psychiatric troubles to poor early home life. However, to preserve our perspective we must not forget the seven pairs where factors predisposing to neurosis were present in the home of one twin but where there were no associated differences between the twins in neurotic behaviour, either as a child or an adult.

### **Social and multiple factors**

Early background can be presumed to have influenced other traits besides neurotic ones, for example those of a social kind.

One twin was brought up in a country district by a schoolmaster who was a local Justice of the Peace. She in turn married a schoolmaster and has been active in local Red Cross and other voluntary work. Her twin sister who was brought up in a London working-class home shows a number of resemblances in personality, but she has not devoted herself in the same way to public affairs. She married a meat salesman.

Social class differences were not marked in our series, but even so there was a tendency for the twins who were brought up in slightly better off circumstances to marry someone who was correspondingly better off. The character of the spouse was also a factor which could sometimes be seen to influence the lives of the twins.

Where the twins were brought up or came later on to live in different parts of the country, one could generally notice corresponding differences in behaviour. Jim, referred to earlier as having left Durham as a young man, has more difficulty in making friends in the South than has twin brother, Walter, who has remained in the mining village where he was brought up. Jim also has a duodenal ulcer, but Walter has one of these too.

Another case shows the interaction of social with other factors. Allegedly as the consequence of an accident in which he had concussion, Joe suffered throughout childhood and early adult life from a severe stammer. He took readily to the agricultural work which was found for him by the Children's Home in which he was brought up. He married a woman who had taken pity on him, and she, and perhaps the relatively isolated rural life he has led, have protected him from developing some of the characteristics of his twin, Ted. The latter was brought up in a different Children's Home. He had no stammer and readily fell in with a gang of youths. He ran away to the town and was involved in some minor delinquencies. His sex life has been irregular. In manner he is very different from Joe. He tells tall stories in an exaggerated way, and in an effort to impress he boasted he had been in prison—which was not in fact true.

As in this case so in others, it seems to be a combination of factors, not all operating from early childhood, which leads to differences between twins. Except in the case of the epileptic lads, physical factors did not seem to be very important on their own. But in at least three of the pairs showing the biggest psychiatric differences the more neurotic twin, in addition to having to deal with greater psychological stress, was the weaker of the pair at birth and had more severe illnesses in childhood. Unless I am just reading my own opinions into the material, it seems to me that it supports a multi-dimensional approach to the problems of personality.

### **Methods of upbringing**

One of the most commonly observed differences between the families of these twins occurs where one of them is brought up by a grandmother or a much older aunt, as an only child, often in slightly better financial circumstances and perhaps in the country, while the other is brought up in a town as one of a larger family. Parallel with these differences in age of parent and family structure are quite marked differences in methods of bringing up children—differences in strictness and leniency of discipline, for example, or in the extent to which the child is protected from the environment or encouraged to be independent. It might be thought that these differences would make for differences between the twins in such traits as reserve and anxiety. So far, the material has not shown any very clear-cut tendencies of this kind. The strongest suggestion is that where greater protectiveness is combined with being an only child (and perhaps at the same time with having a much more old-fashioned person as a mother) the result is the rather greater quietness or reserve of that twin. This was so in seven cases. In one case the twin subjected to these influences was the less reserved, while in five cases twins with this difference in background did not seem to differ in quietness or reserve at all.

From the material as a whole one gains the impression that the personality of the mother and her methods of child rearing can vary quite a considerable degree without fundamentally altering the personality of the child.

A good example of this is the case of Jill D.

and Veronica S. These twins were adopted when they were three months old by unrelated women of similar social status in the same town. Both were brought up to all intents as only children, though Jill had a much older foster brother. The girls are now  $8\frac{1}{2}$  and by quite a long way the youngest in the series. It was possible in this case to interview and test the parents and to observe the twins in their home settings. Mrs. D. describes herself as being a noisy type. She has many social interests, including political ones. She is a more dominant woman than Mrs. S. and Jill has come in for more spankings. She believes that children should be treated as puppies right from the beginning to know who is boss. Jill was taught her letters before she went to school and has been sent to ballet classes. She has also been taught to fend more for herself. Attempts were made to prevent her from becoming friendly with Veronica by sending her to a different school, and in order to stress the differences between them Mrs. D. has had Jill's hair permed. Mr. D., a steel worker, is quiet and patient.

The S. family is very different from the D's. Mr. S. is lively but inclined to be irritable, while Mrs. S. presents a marked contrast to Mrs. D. She is quiet, very placid and with no social interests. She has no decided views on the upbringing of children and is perhaps rather too much inclined to let events take their own course. She thinks she may have spoiled Veronica by letting her have too much of her own way; and there has not been so much educational or cultural stimulation in Veronica's home. These twins came to our notice through the school teacher who saw them when they first went to the same school at the age of five. They did not at this time know that they were twins, but they immediately gravitated towards one another, were never apart, wanted to sit at the same desk and progressed at the same rate. One is reminded of the findings with identical twin cattle who are reported to be able to find each other after they have been reared apart and to like to drink together. From observation and from independent accounts from their parents, the girls are very much alike in personality, and are certainly not at all cow-like! They are lacking in shyness, are active in social activities both in

and out of school. They have lively gestures, are inquisitive and rather crave excitement. They are perhaps inclined to bully other children and are determined to get their own way, but seem happy and present no serious problem. They show an equal fondness for reading and music. Many similarities in mannerisms and gestures were noted. When together Jill takes the lead and Veronica lacks confidence compared with her twin. This is the sort of difference often found in twins brought up together, though it is certainly tempting to say in this case that Jill is the leader because she has been given more encouragement. Veronica's lack of confidence, for example in doing the tests, may partly be due to the fact that she happens to be in a higher class at school where perhaps too much is being demanded of her. Both twins however, are of above average intelligence. Basically, I think all observers would agree, they are very much alike in personality. It can perhaps be said that the parents, who are very fond of the girls, have in their own ways given them a chance to develop normally and happily, and that being identical twins they have developed along similar lines.

### Conclusions

I have tried to give you a general survey of these thirty-eight pairs of twins that I have been fortunate enough to be able to investigate, concentrating particularly on their personality resemblance and on some of the presumptive causes of difference between them. As I pointed out at the beginning, the study is not quite complete and the conclusions so far must be regarded as tentative. Moreover, without more detailed exposition of the case histories than I have been able to give in the course of a talk, I would not expect you necessarily to accept my deductions from them as being correct—in my discussion of earlier work on the subject I showed how easily the investigator's own bias can influence the interpretation he puts on his results. I will, however, be bold enough to risk one conclusion. I think I shall be able to show with reasonable objectivity that uniovular twins fairly often show quite striking similarity in important aspects of personality, even when they have been brought up from an early age apart from each other, and by mothers of different character.



The traditional method of twin research, where uniovular pairs brought up together are compared with binovular pairs brought up together, has been criticized on the grounds that uniovular twins are too much of a special case for this method of genetical investigation to be of much value, at any rate so far as psychology is concerned. These critics incline to the view that if identical twins are alike in personality, it is probably because they have been treated alike in a number of subtle ways by the same mother, both on account of her particular psychological make-up and because of social attitudes towards twins; further—so this view goes—the twins will for various reasons have influenced one another in their behaviour, they will have “identified” with one another. Our material shows that uniovular twins can be alike without the operation of these subtle intra-familial or inter-twin relationships. If nothing else, it goes some way towards vindicating some of the pre-suppositions of twin research.

Those critics who say that environmental differences between binovular twins brought up together are too large for them to be of any use for genetical research are generally the very ones who also say that the environmental differences between identical twins brought up apart are not as a rule extreme or their separation early enough for any deductions to be justifiably drawn from them concerning heredity. If my analysis of these separated twins is correct, early age of separation is not always such a vital point as those critics have sometimes suggested. However, it must be agreed that in some respects the social differences between the families in which most of our twins were brought up were not very large. It would, therefore, be unwise when we come to evaluate the final results, to claim that genetical factors would show up as clearly if the environments of the twins were radically different.

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#### REFERENCES

- 1 Blewett, D. B. An experimental study of the inheritance of intelligence. 1954. *J. ment. Sci.* **100**, 922–933.
- 2 Burks, Barbara S. A study of twins reared apart under different types of family relationship. In: *Studies in Personality contributed in Honour of Lewis M. Terman*. New York, 1942. McGraw-Hill (pp. 35–70).
- 3 Burks, Barbara S. and Roe, Anne. Studies of identical twins reared apart. 1949. *Psychological Monographs, general and applied*. **63** (5), 1–62.
- 4 Craike, W. H. and Slater, E. Folie à deux in uniovular twins reared apart. 1945. *Brain*, **68**, 213–221.
- 5 Gardner, Ivy C. and Newman, H. H. Mental and physical traits of identical twins reared apart: Twins Lois and Louise. 1940. *J. Hered.*, **31**, 119–126.
- 6 Juel-Nielsen, N. 1957. Personal communication.
- 7 Juel-Nielsen, N. and Mogensen, A. Uniovular twins brought up apart: Preliminary report of a psychiatric-psychological study. 1957. *Acta. genet. et stat. med.*, **7**, 430–433.
- 8 Kallmann, F. J. *The Genetics of Schizophrenia*. New York, 1938. Augustin.
- 9 Lange, J. *Crime as Destiny*. London, 1929. Allen and Unwin.
- 10 Muller, H. J. Mental traits and heredity. 1925. *J. Hered.* **16**, 433–448.
- 11 Newman, H. H., Freeman, F. N. and Holzinger, K. J. *Twins: a Study of Heredity and Environment*. Chicago, 1937. University of Chicago Press.
- 12 Saudek, R. A British pair of identical twins reared apart. 1934. *Character and Personality*, **3**, 17–39.
- 13 Schwesinger, Gladys. The effect of differential parent-child relation on identical twin resemblance in personality. 1952. *Acta. genet. med. et gemellol.*, **1**, 40–47.
- 14 Shields, J. Personality differences and neurotic traits in normal twin school-children. 1954. *Eugen. Rev.*, **45**, 213–245.
- 15 Slater, E. and Shields, J. Twins in psychological medicine. 1955. Paper read to the British Association and reported in: *Nature*, **176**, 532–533.
- 16 Stenstedt, A. A Study in manic-depressive Psychosis. 1952. *Acta. Psychiat. Kbh. Suppl.* **79**.
- 17 Woodworth, R. S. *Heredity and Environment*. 1941. Bulletin 47, Social Science Research Council, New York.
- 18 Yoshimasu, S. Psychopathie und Kriminalität, 1941. *Psychiatria et Neurologia Japonica*, **45**, 455–531. (In Japanese with German Summary.)